

SHELLFISH COMMITTEE

by
E. Edwards
1981

MOLLUSCA

Belgium

(Reporting on Crustacea only)

Canada

(G.P. Ennis)

Illex illecebrosus

Three cruises (one jointly with USSR) were conducted between January and June in the area extending seaward from the continental shelf from south of the Grand Banks to Sargasso Sea to investigate the distribution and abundance of larval and juvenile squid. Additional cruises were conducted on the Grand Banks in June and on the Scotian Shelf in June and again in August-September (jointly with France) to investigate abundance, distribution, and biology of squid in these areas.

In inshore areas tagging studies were conducted to elucidate migration patterns. Field and laboratory studies into various aspects of squid biology and ecology, including food and feeding, life cycle, growth and maturation, reproduction, egg and larval stages and parasites, were carried out as well.

Placopecten magellanicus

Scallop research surveys were conducted in the northern part of Georges Bank, on the Scotian Shelf, in the Bay of Fundy near Digby, and near Grand Manan and in Northumberland Strait. Throughout these surveys, data on age-specific abundance, density, growth, and yield characteristics were collected from selected depths and locations.

Simultaneous sampling of BRUTIV and benthic collecting gear was initiated in areas of high productivity on Georges Bank in an attempt to characterize areas of high scallop productivity.

Chlamys islandica

The two dimensional systematic survey carried out in 1980 on the stock of Iceland scallops in the northeastern Gulf of St. Lawrence was replicated in 1981. The results indicate that the population size (numbers or weights) has changed little between the two years.

Meanwhile the scallop fishery in this area continued for the third consecutive year. Both effort and total landings have increased from 1980 levels, but CPUE has dropped marginally. Total landings from this fishery in 1981 was 1,380 MT (round).

Arctica islandica

A two-month (June to July, 1981) hydraulic dredge survey of the inshore ocean quahog resource was conducted in major bays from Port Medway to Cape Sable in southern Nova Scotia. These surveys obtained data on abundance, distribution, growth, and meat yield. A large number of quahogs were marked and released to determine growth increments.

A two-week (August, 1981) hydraulic dredge survey of the ocean quahog and other molluscan resources of the offshore Scotian Shelf and northeastern Georges Bank was conducted using a specially equipped USA research vessel. This was the first large survey of benthic molluscan resources on major banks of the Scotian Shelf. Principal target species were Arctica islandica, Spisula polynyma, Placopecten magellanicus, Chlamys islandicus, Serripes groenlandicus, Cyrtodaria siliqua, and Modiolus modiolus.

Mytilus edulis

Experimental culture of the blue mussel was continued to assess variability and replicability of growth rate and meat yield of cultured mussels. Monitoring of mussel larvae blooms was also completed.

Monitoring of meat yield and gonad condition in a soft-shell clam population in eastern P.E.I. was carried out during the growing season.

Crassostrea virginica

Oyster resource enhancement included provision of biological and technical assistance to P.E.I. Fisheries for bottom shelling in Summerside Harbour and assessment of past oyster-relaying projects in this area.

Oyster spatfall monitoring and prediction services were provided to oyster culturists for Caraquet Bay, N.B., North St. Simon, N.B., and Ellerslie, P.E.I. A successful spat collection was achieved by industry and various government programs in two of the three areas.

Denmark

(Reporting on Crustacea only)

France

(J. Audouin)

Ostrea edulis

La régression de la maladie due à Marteilia refringens semble s'être confirmée en 1981. Les secteurs qui restent touchés sont en Bretagne sud : rivière de Pénérif, pointe de Penwins, rivière d'Auray et Golfe du Morbihan et en Bretagne nord, les gisements naturels de la rade de Brest à l'exception de Roscanvel.

Tous les centres importants d'élevage sont touchés par l'épizootie due à Bonamia ostreae à l'exception de la partie sud-est de la rade de Brest (secteur de Loumergat) et des côtes méditerranéennes. Les mortalités constatées sont comprises entre 50 et 90 %. Contrairement aux huîtres de 18 mois, 2 ans et 3 ans, le naissain est peu affecté (0,12 %) par la maladie.

Les essais d'infestation expérimentale en laboratoire ont montré que la contamination peut se faire directement d'huître à huître par l'intermédiaire du milieu.

La production de naissain est évaluée à 200 tonnes environ. La production d'huîtres à la consommation n'aurait pas dépassé 2 000 tonnes.

Crassostrea gigas

Gisements naturels exploités : Malgré un excellent captage en 1980 et le maintien de la fourniture en 1981, les gisements de St Palais à Royan ne présentent pas une grande abondance d'huîtres de 1 an. Les autres gisements, pêchables à pied, ouverts en 1981 ne pourront pas supporter d'exploitation en 1982. Les gisements pêchables à la drague ont subi un effort de pêche important en 1981 et seront laissés fermés en 1982. La situation des bancs naturels d'Arcachon reste stationnaire du fait du manque de recrutement depuis 1977. Les bancs non émergeants de l'estuaire de la Gironde n'ont pas retrouvé leur prospérité des années 1960 à 1965. En revanche, le recrutement de 1981 a été très abondant sur les bancs émergeants. Les facteurs limitant susceptibles de perturber le déroulement du cycle sexuel et le comportement des larves d'huîtres ont été étudiés (I.S.T.P.M. La Tremblade) ainsi que la croissance en relation avec les facteurs de l'environnement.

Les études sur les anomalies de la calcification sur le chambrage avec production de gel se sont poursuivies, en relation avec l'action des peintures anti-fouling.

Mytilidae

Mytilus edulis

Une étude portant sur l'estimation actuelle et prévisionnelle de l'importance des stocks de moules des 3 grandes moulières naturelles du N.E. Cotentin : Barfleur, Réville et Ravenoville a été entreprise (I.S.T.P.M. et Comité Local des Pêches Maritimes de St Vaast La Hougue). Une enquête sur la pêcherie a été effectuée à l'occasion d'embarquements sur navires professionnels pour échantillonnages. Une campagne du N/O Roselys s'est déroulée en octobre 1981 dans le cadre de cette étude. Les observations sur les fréquences de taille ont porté sur plus de 30 000 moules.

Des techniques nouvelles pour l'élevage des moules ont été essayées et comparées aux techniques classiques (I.S.T.P.M. La Rochelle). Le but de l'étude est d'améliorer le rendement des bouchots afin d'augmenter la production mytilicole.

Pectinidae

Pecten maximus

Gestion des stocks :

Malgré la diminution des ressources, particulièrement nette en Baie de Saint Brieuc, 14 à 15 000 tonnes ont été débarquées lors de la mission 1980/81 dont 8 900 tonnes en Manche Orientale et 4 040 en Baie de Saint Brieuc.

En Baie de Saint Brieuc, l'exploitation des ressources est contrôlée grâce aux statistiques des débarquements, fournies par la Chambre de Commerce et des échantillonnages effectués dans les différents ports (Comité d'expansion économique des Côtes du Nord et CNEXO - COB). En Manche Orientale, le contrôle se réduit à l'exploitation d'un nombre limité de fiches de pêche.

Les stocks de coquilles Saint Jacques dans ces deux secteurs ont été estimés, comme chaque année au cours de deux campagnes d'échantillonnages réalisées l'une avec le N.O. Roselys II (ISTPM) (18 août au 3 septembre 1981), l'autre avec le N.O. Pélagia (ISTPM). Une attention particulière a été portée à la situation en Baie de Seine, secteur très exploité où les fluctuations du recrutement sont importantes.

Travaux de Zoologie et Groupe d'Endocrinologie comparée de l'Equipe associée CNRS 491 à l'Université de Caen (Prof. LUBET, Prof. STREIFF, Prof. PRUNUS).

Laboratoire de Zoologie et Groupe d'Endocrinologie comparée, Equipe de recherche associée CNRS 491 - Université de Caen - Dr. Prof. P. LUBET, Pr. W. STREIFF, Pr. G. PRUNUS, 4 Dr. Sc, 5 dr. 3ème cycle, 5 Th. (17 chercheurs).

1) Biologie de la reproduction (Gastéropodes, Lamellibranches)

Différenciation sexuelle, cytologie et fonctionnement des gonades et tractus génitaux, étude des facteurs externes et internes contrôlant les gamétogénèses, la maturation, la ponte ou spermiation, le fonctionnement des tractus - Etude cyto-logique et biochimique des ganglions nerveux (hormones aminergiques et polypeptidi-ques) - Actions des polluants et des parasites (plathelminthes).

2) Physiologie de la nutrition (Céphalopodes, Lamellibranches, Gastéropodes)

Cytologie et fonctionnement du tractus digestif et glandes annexes, diges-tion, enzymologie, métabolisme des réserves et leur contrôle endocrinien. Contrôle endocrinien de la croissance.

3) Ecologie et Ecophysiologie des Mollusques (Gastéropodes et Lamellibranches littoraux de l'Ouest : Manche).

Federal Republic of Germany

(R. Meixner)

Mytilus edulis

Monitoring of mussel beds along the German North Sea coast and in the Flensburg Fjord has been continued by the Institut für Küsten- und Binnenfischerei.

Cardium (= Cerastoderma) edule

Cockle beds along the German Wadden coast of Niedersachsen and Schleswig-Holstein were again surveyed by the Institut für Küsten- und Binnenfischerei.

ICELAND
(U. Skuladóttir)

Chlamys islandica

Scallop surveys were carried out on all the most important fishing grounds at West and Northwest Iceland. Survey catches per area swept remained high and catch per unit effort increased in most of the individual fisheries. Total landings rose from about 9 000 m tonnes in 1980 to approx. 9 900 tonnes in 1981 in accordance with the recommended increase in TAC for each year.

Routine surveys will be continued in 1982. Furthermore an underwater photography survey is planned on chosen scallop beds in West Iceland.

IRELAND
(J.P. Hillis)

Ostrea edulis

Spatfall was monitored in Tralee Bay and Clew Bay. Oyster growing-bags filled with mussel shell were used for spat collection and found to have significant advantages over lined collectors.

Mytilus edulis

Large scale transplantation of mussels was undertaken from natural beds at Cromane in the south-west to apparently suitable sites - at Glandore and Kenmare - lacking pre-existing populations with successful results.

Pecten maximus

Settlement studies showed settlement in Lough Ine on the south coast to be the strong for the first time since 1976. In Mulroy Bay three separate settlements occurred, the only significant one in July, being comparable to that of 1980 and about 1% the strength of that in 1979, as in 1980, settlement was concentrated in the north-west of the area. Settlement in Dunmanus and Bantry Bays (south-west) was much the poorest since 1977.

Natural mortality due to anemones *Inthoppleura balli* was noted in Lough Ine, and is considered to be potentially a significant component of mortality in some areas.

Investigations on molluscs are also report to the Mariculture Committee.

Netherlands
(A.C. Drinkwaard)

1. Ostrea edulis L.

Oyster research and enhancement programmes included hydrographic base-line studies in the Oosterschelde, spatfall monitoring, spatfall prediction service, control of forthcoming populations and allowable catch estimations concerning the native Zeeland flat oyster in several locations of the lake Grevelingen. The spatfall showed good results and continued from July till in October, due to prolonged summer temperatures. About 8,000 m³ musselshells, nearly twice the quantity in 1980, are brought as culth to this 11,000 hm² non tidal spatting pond for spat collection on about 100 hm² cleaned parts of proper bottom.

Close on 3 million consumption oysters are withdrawn from this non-diseased enclosed sea-arm to supply the commercial market at the end of the year. The oysters are stored at Yerseke in protected semi-closed oyster pits, surrounded by dikes. Afterwards the total stock of oysters in the lake Grevelingen has been estimated at 20 million, about 1,000 MT.

The littoral zone of the Oosterschelde was open for public picking of Crassostrea gigas.

Within the multi-disciplinary project-group MARIOS (Mariculture Oosterschelde) innovation studies started for creating large scale hydro-gravity-fed oysternurseries between sea-water storage polders on high and low level, lying inside the Oosterschelde dam in 1986. Other mariculture targets are included in this multi-purpose project.

2. Mytilus edulis L.

During the season 1981 - 1982 total mussel landings at the auction at Yerseke and commercial storage and rewatering plots at the Yerseke Bank respectively touched the quantity of 100,000 MT on January 25th, 1982. The production of the Waddenzee was normalized and amounted to around 70 %. As well in the north as in the south the meat quality was very good.

3. Cerastoderma edule L.

Cockle research concerned growth and fattening in relation to environmental conditions and population densities.

Total landings runned into a still higher level than in 1980 and were in excess of 8,000 MT of shucked meat (50,000 MT raw cockles). This year the

cockle shallows of the Oosterschelde were completely closed for this fishery. Processing and marketing of the preserved meat caught all likely attention to establish some relief in this branch of newcomers.

4. Environmental conditions.

The cooperative hydrographic research was focussed on the sedimentation - erosion balance in the present-day situation of the Yerseke Bank in the eastern part of the Oosterschelde and after the reduction of the tide by the storm-surge-barrier across the mouth of the Oosterschelde in 1986, simulated in hydraulic and mathematic models of the Transport and Public Works Department.

Hydrographic and culturetechnic base-line studies in the mussel-culture areas of the Oosterschelde are prepared and proposed to identify appropriate measures in achieving the best possible environment for continuing musselculture after the Delta works are finished.

Comparative investigations are undertaken concerning the water quality in different oyster storage pits at Yerseke, in view of rebuilding these old 19th century basins. The differences in storage density, sea-water treatment and all other handlings are assessed and analysed in order to determine the necessary basic conditions and operation guidelines in future.

5. Diseases and pests.

The introduction by commercial import activities of the oyster pathogen Bonamia ostreae (microcell disease) in the Dutch oyster-culture in 1980 has resulted in strong measures for safeguarding the Oosterschelde in future. This compassed serious effects on the 1981 production of the Yerseke Bank area.

Studies at the end of the first year of the introduction have clearly shown that the microcell disease was capable to settle and to spread. Therefore it was found necessary for 1981 to stop all importations of oysters from France and to prohibit all planting of oysters in the Oosterschelde, both from other countries and from the lake Grevelingen. In addition an order was issued to clean all the beds in the affected area as far as practicable by dredging. Transport of molluscs from the affected area to other areas for planting was forbidden as well.

To check the effects of the mentioned measures, a study was set up in spring with disease-free oysters of Grevelingen origin, placed in flat gauze bags as indicators at several plots of the Yerseke Bank. The oysters were sampled every 4-5 weeks and histologically examined for the occurrence of the pathogen and other effects of the microcell disease. The results showed that the first 3-4 months after planting no infection could

be observed. However, in August the first clear indications of the disease were found to be present in the experimental lots. It seems that an incubation time of probably 3-5 months is present in active oysters. Otherwise the main result of the indicator experiment is that the Yerseke Bank was still infectious during 1981, despite the very low oyster density due to the clearance operation. It indicates that this disease will not be eliminated easily and that it will need a prolonged programme of control during an extended period with "empty" oyster plots. For this reason the total cessation of oyster-culture on the Yerseke Bank is continued for 1982.

6. Molluscan shellfish toxicity and sanitary control.

In the end of September 1981 a sudden outbreak of gastro intestinal mussel poisoning in the Dutch Waddenzee struck several consumers of "wild" mussels at the Isle of Terschelling (not under safety control). Within one week toxicity was also detected in mussels of the western part of the Oosterschelde. The principal suspected dinoflagellates present in musselguts were Prorocentrum micans and Dinophysis acuminata. During the four weeks period of toxicity, checked by the rat-food-test, both mussel-culture areas were closed for market fishery.

The mussels on the storage and rewatering plots (200 hm²) in the eastern part of the Oosterschelde remained free from phytoplankton toxins. Consequently the supply of mussels from this area to the wholesale and retail market has been continued without any delay.

The results of the sanitary control were well within the requirements of the water quality in the natural growing and storage areas.

Norway

(K.R. Gundersen)

Cephalopods

Todarodes sagittatus

During the spring and early summer of 1981 squid from the 1980 invasion were still present in the eastern North Atlantic and eastern Norwegian Sea, with maximum dorsal mantle length (DML) of females 50 cm, of males 40 cm. Single mature males and maturing females were observed. A new invasion, of even greater dimensions than that of 1980. started in June-July. Materials

for investigation were collected from commercial and research vessels during January-April and August-November. During the latter period, 3500 squid were tagged with anchor tags in coastal areas of western and northern Norway. At the end of 1981, 30 tags had been returned, most of them from the tagging localities. Maximum time in liberty was two months. Five recaptured squid had doubled their weight from less than one kg to 1,9 kg.

Reading of growth rings continued. Great variations were observed in number of rings in squid with the same DML, indicating varying growth rates. Maximum length of life seems to be 12-14 months. Age composition of the samples of squid indicates periods with more intensive spawning/hatching in March-May, October-November, and December-January.

Fishing experiments were carried out with purse seine, bottom trawl and jigging machines.

The commercial fishery yielded 6000 metric tons.

Gonatus fabricii (gonatus)

Material was collected during surveys with pelagic trawl for postlarval and 0-group fish in June-September in the Norwegian and western Barents Seas and in the West-Spitzbergen area. In the upper 50 m, juveniles (DML 10-80 mm) were less abundant than in 1980, usually less than 1000 gonatus per half hour's haul. One larger gonatus, DML 126 mm was taken in a haul at 550 m off northern Norway in July.

Stomach contents of juveniles were dominated by amphipods (Parathemisto sp.) supplemented by copepods, chaetognaths, krill and Sebastes larvae. Larger gonatus had also taken small gonatus and Maurollicus muelleri.

Reading of growth zones in the statoliths continued. The age of juveniles was calculated to 100-230 days, but the correlation between age and length was very slight. Larger gonatus seem to be up to one year old, but more data are needed to get reliable figures.

Poland

(J. Porębski)

The Sea Fisheries Institute in Gdynia and its branch in Swinoujście conducted research on squid (mainly Illex spp) in the Northwest and Southwest Atlantic.

Length frequency distribution, sex composition, maturity, food, parasites, vertical and horizontal distribution, and statistics for age determinations were investigated.

Portugal

(M. J. Figueiredo)

CEPHALOPODES

- Distribution et abundance dans la ZEE Portugaise des espèces d'intérêt commercial: Loligo vulgaris, Loligo forbesi, Illex coindetii, Todaropsis eblanae, Sepia spp., Octopus vulgaris et Eledone cirrosa.

- Aperçu général et préliminaire sur quelques aspects de la biologie de Loligo vulgaris, Loligo forbesi et Illex coindetii.
- Essai de contage des anneaux de croissance diaire en statolites de quelques espèces de céphalopodes provenant de la Côte Portugaise.
- Étude de la biologie et pêche. d'Octopus vulgaris dans la region Sud du Portugal (INIP et Université de Lisbonne)
- Sepia officinalis - Biologie et Pêche dans la region de l'estuaire du Sado.

Données d'échantillonnage de la pêche commercial de Céphalopodes (1981)

Octopus vulgaris

Area	Saison	N° d'échant.	N° d'exempl.
IX	1 ^{er} trim.	121	3 543
	2 ^{ème} trim.	157	4 791
	3 ^{ème} trim.	113	3 938
	4 ^{ème} trim.	66	2 116

Loligo vulgaris

Area	Saison	N° d'échant.	N° d'exempl.
IX	1 ^{er} trim.	47	2 069
	2 ^{ème} trim.	25	899
	3 ^{ème} trim.	38	1 960
	4 ^{ème} trim.	31	2 095

Sepia officinalis

Area	Saison	N° d'échant.	N° d'exempl.
IX	1 ^{er} trim.	52	1 206
	2 ^{ème} trim.	54	1 860
	3 ^{ème} trim.	23	534
	4 ^{ème} trim.	15	370

Número d'exemplaires examinés dans les campagnes en mer pendant 1981

	1 ^{er} Trim.	2 ^{er} Trim.	3 ^{er} Trim.	4 ^{er} Trim.	AND 1981
Loligo forbesi	59	18	-	101	178
Loligo vulgaris	135	1017	-	374	1526
Illex coindetii	116	309	-	262	687
Todarodes sagittatus	-	1	1	2	4
Todaropsis eblanae	35	322	-	119	476
Eledone cirrosa	49	43	-	200	292
Octopus vulgaris	4	12	-	211	227

Données d'échantillonnage pour
Parapenaeus longirostris, 1981

Région	Saison	N° de échant.		N° de indiv.	
		Bateaux recherches	échant. commerc.	Bat.rech.	éch.com-merciaux
IX	1 ^{er} trim.	11	-	726	-
	2 ^{ème} trim.	-	19	-	2 070
	3 ^{ème} trim.	20	19	5 400	1 592
	4 ^{ème} trim.	2	20	688	1 820

Données d'échantillonnage pour
Aristeus antennatus. 1981

Région	Saison	N° d'échantillons		N° d'individus	
		Bat. rech.	éch.com- merciaux	Bat.rech.	éch.com- merc.
IX	1 ^{er} Trim.	9	-	934	-
	2 ^{ème} Trim.	-	23	-	2 216
	3 ^{ème} Trim.	19	26	3 251	1 850
	4 ^{ème} Trim.	4	16	408	1 144

Données d'échantillonnage pour
Nephrops norvegicus 1981

Région	Saison	N° d'échantillons		N° d'individus	
		Bat. rech.	éch.com- merc.	Bat.rech.	éch.com- merc.
IX	1 ^{er} Trim.	28	164	6 729	10 815
	2 ^{ème} Trim.	-	181	-	12 100
	3 ^{ème} Trim.	60	123	27 779	8 485
	4 ^{ème} Trim.	17	65	3 363	3 183

Spain
(H. Quiroga)

Studies about the size, dry weight and temperature relations with filtration, respiration and assimilation of Mytilus edulis and Cerastoderma edule.

Cockles, Cerastoderma edule and clams, Venerupis sp.- The cockles and clams natural beds are being studied in order to know the population parameters and for the introduction of regulations based on population dynamics models.

Cephalopoda. - Octopus vulgaris, Sepia officinalis and Loligo vulgaris populations along the NW coast of Africa are being studied and sampled for knowing their population parameters.

SAMPLING DATA FOR CEPHALOPODA

SPECIES	AREA	SEASON	SAMPLES	NUMBER IND. MEASURED
<u>O. vulgaris</u>	22°-26° N	II	40	418
"	"	IV	61	1668
<u>S. officinalis</u>	"	II	40	179
"	"	IV	48	605
<u>L. vulgaris</u>	"	II	44	590
"	"	IV	61	2184

Sweden

(H. Hallbäck)

Cultures of Mytilus edulis have increased during the last three years and different studies of the ecological effects have started.

Crustacea

Nephrops norvegicus: No research activity during 1981

Pandalus borealis : Continued collection of daily reports on catches. Research was carried out with different mesh sizes in the cod-end.

Homarus vulgaris : Collection of daily reports from fishermen. Tagging of berried femals was carried out, Continued trials with escape openings.

Cancer pagurus : Collection of data from crab fishermen.

United Kingdom

1. England and Wales

(E. Edwards)

Pecten maximus

The major scallop fishing areas were visited to obtain information regarding number and sizes of vessels, gear used and grounds worked.

Catch-effort data was extracted from return forms for Area 2299, where the main fishing has been concentrated. The value of this fishery in 1981 was approximately £ 0.8 million, whereas there was much reduced fishing effort in Cardigan Bay and the value of landings there was well below £ 0.1 million. The total national value of scallops was £ 1.7 million.

Stock surveys using dredges were undertaken in area 2299 and in Cardigan Bay, using RV Corella. In 2299 total stocks were similar in quantity to those estimated in 1977 but a reduction of approximately 25% was recorded from 1980-81 in Cardigan Bay.

Recruitment in the English Channel was monitored by means of spat collectors placed off Start Bay. Numbers of Pecten maximus were lower than normal but higher for Chlamys opercularis. 1980 settled Pecten spat had grown to a mean breadth of 55.5 mm in oyster bags at Salcombe with 95% survival since May. These were relaid onto the sea bed pending further growth and survival estimates.

The study of the seasonal variation in meat yield/gonad condition was extended for another year to cover periods missed in 1980 with samples from the Plymouth fishery.

Cardium edule

Cockle surveys (April and January) were undertaken on the Burry Inlet fishery (S Wales) to assess stocks and advise on trends in stock based on assessments of the 1980 and 1981 spatfall. Whereas survival of the 1980 settlement had been good, oystercatcher predation was now having its effect and the 1981 settlement was a virtual failure. Further monitoring is planned.

Buccinum undatum

An additional, commercial trial comparing the cheaply available scad bait was undertaken by fishermen at Wells. Results indicate that scad is as efficient a bait as all others used. A drastic decline in catch rates, accompanying the landing of 'undersized' whelks was noted during 1981. Further investigations are planned.

Ostrea edulis

Stocks of oysters in the industry have remained at a reasonably good level but sales have been difficult in Europe partly due to decline in demand and partly due to increased supplies from Holland. Quantities of young oysters from natural sources continues to decline and output from the majority of recruitment areas show no sign of recovery.

Good results with growing hatchery produced seed have been obtained but batches of seed with poor survival rates still occur. The reasons for this inconsistency are not clear.

Mercenaria mercenaria

The population of American hard shelled clams in Southampton Water was reassessed in 1981. In spite of a good breeding stock being present recruitments have been poor and much of the older stock is growing too large to be marketable. Fishable stocks have been reduced by about 50% between 1979 and 1981 by a combination of

fishing and growing out of marketable sizes. Without a good recruitment it is anticipated that this fishery will be producing reducing catches from 1984.

Shellfish pests

Oyster grounds in England and Wales have continued to remain free from the diseases which have caused severe problems in France. This is considered to be due to the strict control over importations from stocks from abroad for relaying in tidal waters.

It is planned for some basic studies on the life history and reproduction of Ocenebra erinacea will be initiated in 1982 in cooperation with Southampton University.

Scotland
(J. Mason)

Pecten maximus and Chlamys opercularis

Monitoring of the fisheries and assessment of the state of, and effects of fishing on, the principal stocks were maintained. Studies of the settlement and early life history continued. Settlement of both species was studied. Culture of the spat taken on artificial collectors was undertaken under various conditions. In addition experimental seeding of the sea bed with P.maximus was commenced.

Further studies of the mortality and local movements of scallops were made by means of tagging experiments.

Loligo forbesi and Todarodes sagittatus

Landings of both species were monitored and the study of the biology and distribution of T.sagittatus in Scottish waters was continued.

Oysters (Crassostrea gigas)

The study of survival, growth and condition under different conditions was concluded.

Pests and diseases of molluscs

Molluscs for import and export have been examined for pests and diseases prior to licensing or certification. A survey of the distribution of Mytilicola intestinalis in the Firth of Forth, Clyde Sea Area and Solway Firth was carried out.

U. S.A.

(Stephen H. Clark¹ and Michael Castagna²)

General

This report summarizes research activities on commercially important mollusk and crustacean species during 1981 by U.S. federal and state agencies and academic institutions.

The Northeast Fisheries Center (NEFC) of the National Marine Fisheries Service (NMFS) participated in six inshore-offshore bottom trawl surveys and two gear comparison surveys totalling 172 vessel-days at sea which provided data for shellfish species. Additional surveys were conducted for sea scallops (Placopecten magellanicus), surf clams (Spisula solidissima), ocean quahogs (Arctica islandica), and northern shrimp (Pandalus borealis), totalling 62 vessel days at sea. Gear evaluation and testing work was also conducted during scallop, clam, and ocean quahog surveys. NEFC personnel also participated in cooperative sea scallop surveys with Canada. The Massachusetts Division of Marine Fisheries (DMF) conducted inshore bottom trawl surveys. Additional data were obtained during NEFC sea sampling trips aboard commercial vessels in directed shellfish fisheries.

¹National Marine Fisheries Service, Northeast Fisheries Center, Woods Hole, MA.

²Virginia Institute of Marine Science, Eastern Shore Laboratory, Wachapreague, VA.

NEFC personnel also collected a total of 121 commercial samples at dockside and performed 1362 age determinations for surf clams and scallops.

Manned Undersea Research and Technology Program (MURT) personnel continued monitoring of key shellfish species in oil and gas drilling lease areas on Georges Bank and in adjacent submarine canyon areas. Resource inventory work was also continued by several state agencies including those of Maine, Rhode Island, New York, New Jersey, North and South Carolina, and Georgia. Several state agencies also participated in collection of statistical data and/or development and expansion of statistical reporting programs in cooperation with NEFC.

NEFC personnel prepared stock assessment reports for principal shellfish resources and completed other reports and manuscripts dealing with biology and distribution. The Southeast Fisheries Center (SEFC) prepared a data atlas containing biological and distributional information for several Gulf of Mexico species. Studies on a variety of pathogens and parasites continued at the NEFC Oxford Laboratory. Several state agencies also contributed stock assessment work and related research. The Shellfish Technical Assistance Program of the Massachusetts Division of Marine Fisheries (DMF) continued to provide information on management, culture, and harvesting. The Maryland Department of Natural Resources (DNR) initiated studies to determine the distribution and intensity of shellfish diseases in Chesapeake Bay. Cornell University also conducted work on shellfish diseases including attempts to develop immunofluorescent tests for specific pathogens. Rutgers University and other institutions worked on techniques for identification of bivalve larvae. Studies of the

mechanics of external fertilization in decapod crustaceans were conducted at the Ft. Johnson Laboratory (South Carolina).

American Oyster (Crassostrea virginica)

Researchers at Rutgers University and the Virginia Institute of Marine Science (VIMS) continued surveys to determine prevalence and intensity of Minchinia nelsoni (MSX) disease in Delaware Bay and related research on environmental and biological factors contributing to MSX incidence. Studies continued at Rutgers and at the University of Delaware to develop methods of reducing or preventing predation by oyster drills (Urosalpinx cinerea). The University of Maryland continued work on maturation, growth, and survival in different stocks. Agencies within the states of Rhode Island, New Jersey, Delaware, Maryland, and Virginia continued monitoring work and/or surveys to determine the extent of available resources; VIMS, the South Carolina Wildlife and Marine Resources Department (WMRD) and Clemson University conducted evaluations of mechanical harvesting gear. Researchers at VIMS and the University of Maryland continued genetic studies to improve growth, survival, and resistance to disease. Investigations of oyster disease organisms and transmission in natural populations were conducted by several agencies including NEFC, the Delaware DNR and Cornell University. The Florida DNR studied the relationship of pathogenic bacteria and viruses to pollution indicator organisms.

Sea Scallop (Placopecten magellanicus)

NEFC personnel completed research vessel surveys (including participation in Canadian surveys) of major scallop grounds and continued biological studies and stock assessment work. Considerable time was devoted to

providing biological and statistical data and analyses required for development of a fishery management plan. Maine Department of Marine Resources (DMR) personnel continued work on biology, management, and collection of fishery statistics.

Bay Scallop (Argopecten irradians)

The NEFC, the Rhode Island Department of Environmental Management (DEM), the Woods Hole Oceanographic Institution (WHOI), and Boston University studied the effects of physical, biological, and chemical characteristics of estuarine areas in relation to maturation, growth, and survival of hatchery-reared scallops. Several townships in Massachusetts continued research on laboratory culture and seeding. Studies on growth continued at the University of Connecticut. Researchers at VIMS completed studies on factors affecting larval survival.

Calico Scallop (Argopecten gibbus)

The SEFC prepared a fishery profile containing information on biology, management, and economics for the southeastern U.S.

Hard Clam (Mercenaria mercenaria)

The New York Department of Environmental Conservation (DEC) continued development of a population index for assessment purposes, exploratory surveys, monitoring (sanitary surveys), and transplanting. The Delaware DNR studied recruitment potential by monitoring spatfall. The State University of New York (SUNY) continued work on biology and ecology and completed a two-year investigation of the feasibility of planting hatchery-produced seed clams in ~~inshore~~ areas. An annotated bibliography of this species was also completed at SUNY. The University of South Carolina and VIMS studied

biochemical differences and survivability by egg size. The South Carolina WMRD studied reproductive biology, growth, and predator-prey relationships and effects of hydraulic dredging on recruitment and survival.

Ocean Quahog (Arctica islandica)

NEFC personnel conducted stock assessment work and continued age and growth and maturation studies. The Maine DMR also collected statistical data and monitored paralytic shellfish poisoning (PSP) levels. Researchers at WHOI and VIMS continued studies of reproductive biology.

Surf Clam (Spisula solidissima)

NEFC personnel continued stock assessment work and ageing studies in collaboration with University of Maryland (Eastern Shore). The South Carolina WMRD studied larval growth and survival.

Short-finned Squid (Illex illecebrosus)
Long-finned Squid (Loligo pealei)

NEFC personnel continued biological research and stock assessment studies and joint research with Union of Soviet Socialist Republics (USSR) scientists on spawning and distribution of Illex.

USSR

(A.A. Elizarov)

In different bays of the White Sea comparative studies of ecological peculiarities, stock assessments and mapping of mussel concentrations ("banks") were made. Concentrations were most abundant in the Kandalakhsy Bay. It was shown that in the Onezhsky and Dvinsky Bays abundance and biomass of mussels in littoral and upper sublittoral "banks" were much lower. Principal types of mass mussel dwellings connected with intensive water exchange regions of the littoral and upper sublittoral zones and river estuaries (narrow waters, rapids) were found. On the basis of these types several model "banks" were chosen in the Kandalakhsy Bay. To determine production characteristics, data was collected on these banks many times. Peculiarities of distribution and hydrological peculiarities of biotopes were studied.

Studies of peculiarities in the adaptation of mussels to the salinity, temperature and other environmental factors were continued. Salt and temperature tolerance of reproductive cells and molluscs of different age was found. Peculiarities of the distribution, growth rate and the adaptation to salinity of mussels and other molluscs were studied in estuaries. The data on neurohormonal regulation of salinity adaptation processes of mussels were collected and processed.

Mussel banks off the western Murman were investigated.

CRUSTACEA

Belgium

(F. Redant)

Crangon crangon

Bi-monthly samplings of the shrimp stock and its predators off the Belgian coast were continued in 1981 in order to obtain data on egg production, natality, recruitment, production and mortality of brown shrimp. The study on long-term population dynamics of the shrimp stock and of competitive and predatory interactions with epibenthic and demersal species was also continued.

Similar analyses on other epibenthic species were started in order to evaluate long-term changes in epibenthos species composition and in the abundance and biomass of dominant species (e.g. Macropipus, Asterias, Ophiura). Since the estimates of benthic abundance and biomass largely depend upon the efficiency of the sampling gear (beam- and otter trawl), comparative experiments, using the parallel haul technique, were performed during autumn 1981. These investigations will continue in 1982.

Nephrops norvegicus

The sampling of commercial Norway lobster catches was continued in order to collect data on its catch and population composition. A study on lobster biometrics was started, especially in view of management measures.

Canada

(G.P. Ennis)

Homarus americanus

Throughout the Maritimes area during 1981, sampling of commercial lobster catches was continued to provide data on size frequency, egg condition, molt stage, catch-per-unit-effort, and by-catch. A Maritimes-wide, voluntary license buy-back scheme was completed December, 1981. About 1,500 licenses were purchased, leaving slightly less than 7,000 lobster licenses available for 1982.

In the Gulf of St. Lawrence, 1978-81 sampling and tag return data have been analyzed and a variety of proposals for management put forward. The initiative for an increase in minimum legal size in the southern half of the Gulf is continuing.

In southwestern Nova Scotia and the Bay of Fundy, analysis of over 30 years of historical data on the Grand Manan and Port Maitland lobster fisheries is progressing; a number of reports and management options have been originated.

Field studies undertaken with SCUBA in southwestern Nova Scotia provided preliminary information on population size structure and densities of early-stage juvenile lobsters in shallow inshore areas. Field work and sample processing were continued in surveys of fecundity, size at maturity morphometrics, and parasites of lobsters. Analysis of stomach contents from lobsters and Cancer crabs around the coastline of southwestern Nova Scotia is progressing; preliminary results demonstrate a substantial overlap in diet and indicate that lobsters and crabs may compete for limited prey resources.

Offshore lobster commercial logbooks from 1980 were analyzed; 1981 logbooks are being processed. Experimental trawl and trapping surveys were carried out on Browns Bank to evaluate trawling as an assessment method for offshore lobsters. An additional trapping survey was undertaken in September/October along two inshore/offshore transects (Seal Island/Browns Bank; Seal Island/Truxton Swell) as part of a study on the seasonal movements and distribution of lobsters and Cancer crabs off southwestern Nova Scotia.

Long-term monitoring of the lobster fishery and studies of various aspects of lobster population biology and dynamics were continued in five localities around the coast of Newfoundland. This included commercial catch sampling, obtaining logs from individual fishermen, collecting tags from previous year's tagging operations, carrying out additional tagging and shell condition sampling. Studies of larval distribution and ecology in a near-shore area were continued. A tag-recapture study of an unfished lobster population around a small island continued.

Pandalus borealis

Sampling of the Newfoundland-based fishery in the northern Gulf of St. Lawrence was continued in 1981 but at reduced levels compared to previous years. One research cruise was conducted throughout the Gulf area, continuing a time series on the distribution and abundance of shrimp and small redfish (Sebastes mentella).

Details of the shrimp fishery off Labrador were obtained through extensive coverage of the fleet by the observer program. A research survey was carried out in the area during July-August.

Preliminary calibration of underwater cameras to study distribution of various invertebrate species, including shrimp, was conducted during a research cruise in Placentia Bay on the south coast of Newfoundland.

Chionoecetes opilio

For the Cape Breton Island inshore snow crab fishery, port and at-sea sampling of commercial catches continued to provide data on size frequency and molt stage. Stock assessments carried out for Cape Breton Island, based on sampling data, fishermen's logbooks, and tag returns indicate continuance of an overall decline in commercial stock size and recruitment failures throughout eastern Cape Breton. Western Cape Breton stocks appear stable. Off northwestern Cape Breton, 3,000 snow crabs were tagged to investigate long-term growth and movement. Surveys off western Cape Breton, with a towed underwater camera sledge (BRUTIV) and a beam trawl, were carried out to assess snow crab density. A study on the morphological and electrophoretic characteristics of snow crabs from Cape Breton, Newfoundland, and western Gulf of St. Lawrence has indicated interactions between Gulf and Cape Breton stocks.

Routine sampling of snow crab landings in New Brunswick and catch-effort data collection have been continued in 1981. A total of nine at-sea sampling cruises on chartered vessels were carried on in the Gulf and estuary of St. Lawrence. Information was collected on abundance, size, maturity, shell condition, dry weight, and protein concentration in serum samples. Direct observation of snow crabs in their habitat was made with the Canadian Navy SDL submersible.

In the Newfoundland fishery sampling of commercial catches at sea and at processing plants continued. Catch and CPUE data for the various management areas were analyzed and biomass estimates based on 1980 data derived. Tagging studies to determine movement and fishing mortality continued and analysis of the 1979 and 1980 tagging programs were carried out. Initial attempts to develop a tag which will be retained through a molt have been successful and efforts in this area have continued. In an attempt to develop independent biomass estimates the feasibility of using underwater television and a random stratified trapping survey were examined. Initial results of these projects are encouraging.

Cancer borealis

A trap survey of the distribution and relative abundance of Jonah crab was conducted and included areas along the edge of the Scotian Shelf from the west side of Emerald Bank to The Gully east of Sable Island and off southern Nova Scotia including Browns Bank and two transects, one north of Browns Bank to Seal Island and the other west from Seal Island to the Canada/USA border in the Gulf of Maine. Biological data included size frequency distribution, sex ratio, and the incidence of berried females and soft-shelled crabs.

Geryon quinquedens

A trap survey for red crab was conducted along the Scotian Shelf edge from the western side of Emerald Bank to The Gully east of Sable Island. The survey provided estimates of total trappable numbers and biomass for depths of 183 m to 732 m. Commercial potential was assessed as total trappable numbers and biomass after the culling of small commercially unacceptable crabs. Biological data were examined relative to depth and included size frequency distribution, sex ratios, and the incidence of berried females and soft-shelled crabs. The effect of trap soak duration on the size and composition of the catch was examined.

Lithodes maia

Stone crabs were captured during trap surveys for red and jonah crabs along the edge of the Scotian Shelf. Data analysis will include size-frequency distributions, sex ratios, and the incidence of berried females and soft-shelled crabs.

MARINE PLANTS

Chondrus crispus

Historical catch, effort, catch-per-unit-effort, and standing crop assessments were analyzed to determine the primary causative factor in recent low landings for southwestern Nova Scotia. A decline in overall level of effort was the primary reason for the decline, although there have been yearly fluctuations in abundance and resource accessibility.

Laminaria longicruris

The distribution, growth, recruitment, and mortality of Laminaria populations were the subject of studies to develop a kelp management model.

Preliminary results indicate that these parameters vary with site, particularly in relationship to wave exposure and substrate stability.

INSHORE MULTISPECIES STUDY

Re-examination of a large sea urchin front near valuable seaweed resources in southwestern Nova Scotia found no large-scale changes in sea urchin distribution. However, a large-scale die-off of sea urchins was documented for the southeastern coast of Nova Scotia.

An ongoing study designed to assess the importance of kelp beds to commercial fish and invertebrate populations has entered its second year.

Denmark
(S. Munch-Petersen)

Pandalus borealis

During 1981 a special investigation of the by-catch from the Danish fishery for Pandalus was carried out, mostly by sampling the shrimp vessels from Hirtshals.

France
(J. Audouin)

Cancer pagurus

L'étude engagée en 1979 sur la côte de Bretagne sud s'est poursuivie en 1980 et 1981 selon trois axes principaux :

- embarquements réguliers à bord de navires de pêche professionnels
- marquages portant surtout sur des juvéniles
- observations macroscopiques et histologiques pour étudier le cycle sexuel

Une étude sur le tourteau en Iroise-Manche a été amorcée.

Maia squinado

Les observations sur l'abondance des immatures en Baie de Saint Brieuc ont été poursuivies. Une partie des données recueillies depuis 1975 sur la pêcherie d'araignée du Golfe Normano Breton a été analysée (ISTPM - CORPECUM).

Palinurus mauritanicus

Une analyse des statistiques de débarquement saisies à Camaret et Douarnenez a été réalisée en 1981 (stagiaire ENSAR - ISTPM). Une modélisation adaptée à la langouste rose a été élaborée et testée sur des simulations. Des observations complémentaires sur la reproduction et la croissance ont été faites. Les captures de cette espèce sur les côtes de Mauritanie, supérieures à 3 000 tonnes en 1961 et 1962 étaient tombées à 200 tonnes en 1970. Depuis cette date, malgré une diminution constante de l'effort de pêche elles progressent régulièrement. Elles dépassent actuellement 700 T/an.

Homarus gammarus

Une estimation des captures et de l'effort pour les dix dernières années a été faite (étude CORPECUM). Les apports indiquent une stabilité globale qui n'exclut pas les fluctuations annuelles. Des échantillonnages sur les captures ont été faits au cours de 49 interventions dans des viviers commerciaux. L'exploitation des données depuis 5 ans a permis d'établir la taille de 1ère maturité chez les femelles. Elle est atteinte à 28 cm (LT) ; à la taille légale actuelle, le taux de femelles mures est nul. L'étude de la fécondité a été entreprise.

Des compléments aux études en cours sur la croissance (CLPM - Blainville - ISTPM Ouistreham) sont menés : prospections et marquages sur les cantonnements de l'Île d'Yeu (ISTPM - ARFAC), du Grand Trou et de la Basse Michaud suivis de juvéniles en milieu semi-naturel (APASUB), etc...

Une étude électrophorétique a été entreprise (ISTPM) afin de disposer de critères de distinction des espèces européenne et américaine et des hybrides issus de ces deux espèces. Des expériences portant sur l'essai de marques magnétiques codées ont été entreprises (APASUB).

Les opérations de repeuplement des zones côtières ont porté sur l'immersion de post-larves produites en éclosérie. La production des écloséries s'est élevée à 156 000 post-larves et 10 000 juvéniles pour l'éclosérie d'Yeu ; 107 000 post-larves et 10 000 juvéniles pour celle d'Houat et 20 000 post-larves pour celle de Sein.

Nephrops norvegicus

(Travaux de l'I.S.T.P.M.)

La priorité a été donnée à l'étude de la pêche de langoustine de Mer Celtique (divisions VII g et VII h). La pêche du Golfe de Gascogne n'a fait l'objet que de travaux sporadiques.

Pêche de Mer Celtique :

L'essentiel des travaux a porté sur l'échantillonnage de la langoustine et des captures accessoires. Le point a été fait sur l'activité des flottilles françaises opérant en Mer Celtique (VII f et g). La flottille artisanale constituée des cha-

lutiers de moins de 50 tonneaux travaille essentiellement sur la langoustine. Les tonnages débarqués sont les suivants :

langoustiniers (Nb = 190) - 3 300 T de langoustine et 7 000 tonnes de poisson.

Pêcherie du Golfe de Gascogne :

Des échantillonnages des débarquements de langoustine et de la capture accessoire, synchrones de ceux effectués sur le Plateau Celtique ont été entrepris à Saint Guénolé et Locudy.

Une expérience visant à montrer l'influence de la vitesse de chalutage sur la sélection de la langoustine par le chalut français a été réalisée.

(Travaux du Centre Océanologique de Bretagne (CNEXO - COB))

Les distributions de fréquence de taille, état de maturité des femelles, stade de mue ont été échantillonnés de décembre 1979 à septembre 1981 à bord de chalutiers langoustiniers français travaillant en Mer Celtique. Ces données ont permis, de reconstituer le cycle biologique et la courbe de croissance des langoustines dans cette région. Les caractères biologiques des populations de Mer Celtique (taille à première maturité, périodes de mue) diffèrent nettement de ceux des populations du Golfe de Gascogne.

Le comportement territorial des langoustines a été étudié par télévision sous marine et observation in situ en plongée lors d'une mission de trois semaines en Baie de Bantry (Irlande).

Les captures accessoires des chalutiers langoustiniers français en Mer Celtique ont été échantillonnées en mer de décembre 1979 à septembre 1981. Cinquante quatre espèces ont été recensées quantitativement. Ces captures accessoires ont été comparées à celles de chalutiers langoustiniers de la république d'Irlande et d'Irlande du Nord travaillant en Mer d'Irlande au cours de recherches menées en collaboration avec des scientifiques de ces deux juridictions. Les prises accessoires diffèrent considérablement en Mer Celtique et Mer d'Irlande. La diversité des espèces est beaucoup plus forte en Mer Celtique, par ailleurs on observe beaucoup moins d'individus immatures en Mer Celtique qu'en Mer d'Irlande.

Federal Republic of Germany

(K. Tiews)

Crangon crangon

Long-term investigations by the Institut für Küsten- und Binnenfischerei to assess the shares of undersized protected fish species in the catch of the German brown shrimp fishery were continued. This research work also takes into account the fluctuations in the abundance of fish species found on the shrimp fishing grounds.

Assessment work on the dynamics of brown shrimp populations along the German North Sea coast went on, as well as a study on the predator-prey relationship in the Crangon fishery.

Co-operative young fish and brown shrimp surveys in the Wadden areas of Belgium, the Netherlands and the Federal Republic of Germany were continued.

PROGRAMME	for Shellfish Research in	1 9 8 2
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Crangon crangon

Analyses of brown shrimp catch samples by species and length will be continued by the Institut für Küsten- und Binnenfischerei, as well as the co-operative young fish and brown shrimp survey in the Wadden areas of Belgium, the Netherlands and the Federal Republic of Germany.

Mytilus edulis

Monitoring work on size and age composition of mussel beds along the German North Sea coast and in the Flensburg Fjord will be continued by the Institut für Küsten- und Binnenfischerei.

Cardium edule

The survey work on cockle stocks in the German Wadden area will be continued by the Institut für Küsten- und Binnenfischerei.

Ireland
(J.P. Hillis)

Nephrops norvegicus

Numbers sampled from catches, landings and discards of commercial vessels are as follows

	Quarter	No. of samples	Catch		Landings		Discards	Total
			Male	Female	"Heads"	*Whole		
VIIa	1	2	1063	416	269	155	300	2203
	2	2	790	1424	279	105	309	2907
	3	1	924	939	-	-	-	1863
	4	1	549	291	-	-	-	840
Total			3326	3070	548	260	609	7813
VIIj Q3	2	2	840	101	-	-	-	941

*Cephalothoraces, where only abdomens landed.

Biometric studies to assess maturity in males were continued. In addition a cruise was undertaken with the Nephrops trawl covered with 52 small meshed covers to assess escapement from different parts of its surface.

Joint experiments undertaken with EEC assistance

1. Selectivity This experiment, undertaken with a view to standardising the bases of selection factor assessment involved parallel trawling by an Irish and a French trawler off the east coast of Ireland each using typical Nephrops trawls native to its home area. Catches being examined by personnel from Ireland, France, Northern Ireland and England, and measurements on the net during trawling by gear experts from Scotland. Results are currently being processed.

2. By catch Irish and French personnel co-operated to analyse by-catch obtained by a French trawler in the smalls area of south-west Wales (VII a-g-f) and that of two Irish trawlers off the Irish east coast (VIIa). In the former area, a very mixed by-catch is taken, while in the latter, whiting predominated.

Homarus gammarus

No work to report this year.

Iceland
(U. Skúladóttir)

Pandalus borealis

Research was similar as in previous years. Research vessel surveys were carried out for sampling and information on by-catch. The onset of the autumn season of Isafjarðardjúp was delayed considerably on account of great numbers of 0-group cod as by-catch. During the summer a tagging experiment was carried out on Pandalus montagui using vinyl streamer tags in sea cages. Due to technical difficulties the results were inconclusive. Larval collection is still carried out, although the connection between year class strength and larval abundance can be controversial at times.

The decision of quotas has been based entirely on simple Gulland and Fox models where catch and effort are the basic data. AV.P analysis has been carried out as well, but does not seem to work on populations where growth is fast.

In 1982 research will be carried out along similar lines with an emphasis on improving the methods of division into year classes.

Nephrops norvegicus

Two research vessel surveys were carried out during the Nephrops season (May-August).

Landings increased from 2 400 tonnes in 1980 to approx. 2 600 tonnes in 1981, accompanied by an increase in catch per effort from 46 kg/hour to 52 kg/hour in the two years respectively.

Relatively high catch rates in 1980-1981 compared to many years previous to those are attributed to the recruitment of year classes estimated to be from the period 1969-1973.

Work will continue along similar lines in 1982 with added emphasis, however, on evaluation of stock parameters and stock assessments.

Netherlands
(R. Boddeke)

Crangon crangon

Biological cycle

The results of the research on the quantitative distribution of male and female shrimp in Dutch off shore and inshore waters in April-June and August-September, carried out in 1980 were compiled in a report during this year.

The regular replenishing with fertile males of the sandy coastal zone outside the silty inshore "nursery grounds" will be subject of study during 1981-1982.

Stock assessment

The work on the relationship between stocksize (production of ripe eggs) and recruitment (catch of consumption shrimps) during the year in the four shrimp populations that can be distinguished along the Netherlands and Belgian coast, based on data of 1978-1980, was published. Work on the 1981 data started at the end of the year and will continue during 1982.

Penaeid shrimps

The work on the natural diets and food preference of Penaeid shrimps was focused in this year on Litopenaeus stylirostris and Litopenaeus vannamei, both species of which are cultured extensively in Ecuador. This research, carried out in cooperation with an Ecuadorian shrimp farm, will continue in 1982.

Norway

(K. Gundersen)

Homarus gammarus.

Lobster investigations in the field were carried out as previous years with fishing experiments in the tagging areas in the sherries north and south of Bergen. The lobster stock is still on a very low level in norwegian waters.

Cancer pagurus.

To obtain data of the variations in the crab stock according to sex, size, soft shelled, and berried females fishing experiments with special equipment were carried out on the same place in Bergen harbour as previous years. Fishing times were from the beginning of January to April and from the middle of October to the end of December.

Nephrops norvegicus.

Fishing experiments with creels were carried out in Fanafjord on the west coast of Norway during January - February.

A new type of stackable creels were tested against traditional creels, and artificial baits against natural.

In February - March fishing experiments were carried out along the coast from Måløy to the Oslofjord and on the Egersund bank in order to find places suitable for nephrops creelfishing.

Reports of catch of nephrops from commercial fishermen were collected.

Pandalus borealis.

A stratified random bottom trawl survey of the shrimp grounds in the Barents Sea and the Spitsbergen areas was made in May - Juni 1981. The objectives of the cruise were to study the structure of the shrimp stock, the by- catches of fish and to estimate the abundance of shrimps.

In Troms and Finnmark in northern Norway fishing experiments have been carried out with a shrimp trawler in three weeks every third month in order to find the ecological relation between the prawn stock and the amount of fish. A report will soon be printed.

Spain

(H. Quiroga)

General.- P. longirostris, P. edwardsianus and A. Antennatus populations of NW Africa are being studied.

Norway lobster, Nephrops norvegicus: During the first quarter of the year a cruise has been done in a research vessel along the SW coast of the Iberian Peninsula. Resources maps, yields, length composition, sex, catch and sediments has been studied.

Data on norway lobster fishery along the Atlantic coast of the Iberian Peninsula is being compiled by Portuguese and Spanish scientists. Their report contains information about stocks, catches, fishing effort, cpue, length composition, sex, a review of the biological parameters, assessments and management proposals.

Velvet swimming crab, Macropipus puber : The crab community was studied to detect differences due to mussel raft aquaculture in the ría de Arosa, and to study temporal changes in spatial distributions throughout the ría.

Macropipus puber is the second most important contributing to the biomass in mussel raft areas, and has a high economic value. The reproduction and reproductive cycle, growth as well as general populations dynamics aspects of this species were studied to facilitate a preliminary management.

Lobster, Homarus gammarus: In the summer 1981, 100.000 lobster juveniles have been released in the NW coast of Spain for repopulation purposes.

SAMPLING DATA FOR CRUSTACEA

SPECIES	AREA	SEASON	SAMPLES	NUMBER AND MEASURED
<u>P. longirostris</u>	34°-35°N	II	18	6174
"	"	IV	18	5272
<u>P. edwardsianus</u>	"	II	5	930
"	"	IV	2	314
<u>A. antennatus</u>	"	II	5	400
"	"	IV	1	42

SAMPLING DATA FOR Nephrops norvegicus

1981

Area	Season	No. of samples		No. of fish			
		Research vessels	Market samples	Measured R.s. M.s.		Aged	Racial invest.
VII	1		5		891		
	2		6		1637		
	3		6		1253		
	4		6		1267		
VIII	1	11	15	27	934		
	2		8		730		
	3	15	17	149	1439		
	4		7		668		
IX	1	33	4	939	515		
	2		4		644		
	3	13	10	817	1146		
	4		6		896		

United Kingdom
1. England & Wales
(E. Edwards)

Nephrops norvegicus

A programme of catch sampling for landed and discarded fish and Nephrops in the Eastern Irish Sea was completed and the results are being prepared for ICES WGs. Moulting increment data were collected in the laboratory tanks but moulting frequency estimations were not practical. A comparison between 60 mm and 70 mm codends was achieved with a research vessel giving an SF of 0.34. The EC joint Irish/French trawl experiment was observed. A trawl survey of the Western Irish Sea Nephrops grounds was successfully completed in preparation for the 1982 larval and TV surveys. Fish stomachs were collected to examine predator/prey relationships.

Lobsters (Homarus gammarus)

Data were collected from 'oceanic' and 'shallow sea' sites for a study of fecundity and size at maturity and a paper is in preparation. There seems to be little difference between the two areas sampled, with 50% first maturity at

90 mm CL for both sexes. Monitoring of Gaffkaemia levels in imported N American and European lobsters continued. Legislation was introduced to enable imports and deposits to be controlled by licensing.

The lobster minimum size was increased to 83 mm CL on 1 May 1981 and a further increase to 85 mm CL in two years time is being considered. A flume study on lobster behaviour in relation to current speed was completed and written up. A trial release of 400 hatchery reared lobsters indicated good short-term survival when released on a suitable substrate on grounds off the Yorkshire coast.

Spider crabs (Maia squinado)

Catch-effort and size composition data were collected from fisheries in the Channel. A minimum size of 120 mm CL was recommended. This was implemented regionally and is under consideration for national and EC controls.

Edible crab (Cancer pagurus)

A proposal to increase the size limit for crabs from the English Channel has been presented to the European Commission in Brussels. A diving study demonstrated that there is a large bias against ovigerous female crabs being represented in trap caught samples of populations.

Other Crustacean Fisheries

The fisheries for crawfish (Palinurus elephas), deepwater shrimps (Pandalus

borealis) pink shrimps (Pandalus montagui) and brown shrimps (Crangon crangon) were monitored but not researched.

Homarus gammarus

Commercial landings of lobsters were sampled in all the main fishing areas. Catch and fishing effort data were supplied by selected skippers. The tagging experiments in the Outer Hebrides were completed and those in East Fife were continued using capture-recapture techniques. Return rates in the Outer Hebrides were adequate for the estimation of growth increments but not of moult frequency or mortality rates. Preliminary results from the East Fife experiments were used to estimate annual growth of each sex and fishing mortality rates.

Preliminary experiments were concluded using enclosed ecosystem bags to study the behaviour of lobster larvae in the water column. Initial results suggest that field sampling should be concentrated on the top 3m of the water column.

Native stocks and imported lobsters were examined for gaffkaemia.

Cancer pagurus

Commercial landings were sampled in the main fisheries. Investigations were continued into the mechanisms by which Bruchdreifachbildungen and other limb abnormalities arise in this and other crustacean species.

Macropipus puber

Sampling of the landings in the new creel fishery for this species in south-west Scotland was begun.

Nephrops norvegicus

Sampling of commercial trawl and creel catches continued in most fishing areas. Studies of growth were undertaken in three areas by tagging and by keeping in cages animals which were close to the moult. Fecundity studies and surveys of larval abundance were conducted in Loch Torridon and the Firth of Forth in

order to estimate stock size.

Trials continued with television and photographic cameras mounted on a sledge with a view to surveying some Nephrops grounds on the west coast.

Pandalus borealis

Monitoring of the North Sea fishery continued. Estimates were made of the landed and discarded by-catch. A study of fecundity was started.

Experiments on shrimp trawl selectivity were carried out. Photographic techniques were used to determine shrimp density and study behaviour.

Crangon crangon

Monitoring of the Solway Firth fishery continued.

U.S.A.

(S.H. Clark & M. Castagna)

(See also introduction to Mollusca part on page 18.)

Northern Shrimp (Pandalus borealis)

The Northern Shrimp Technical Committee³ completed an assessment of the Gulf of Maine northern shrimp stock; the NEFC continued biological studies, and the Maine DMR continued stock assessment work, collection of commercial fishery statistics and research on biology and environmental factors affecting recruitment. Maine DMR personnel also initiated development of a "separator" trawl designed to reduce juvenile groundfish mortality.

³The Northern Shrimp Technical Committee is a joint organization of state and federal scientists responsible for research and assessment work on the Gulf of Maine stock.

Brown, White, and Pink Shrimp (Penaeus spp.)

The SEFC prepared stock assessments and conducted biological studies on Gulf of Mexico stocks. The SEFC also analyzed mark-recapture data and concluded gear evaluation studies to develop selective shrimp trawling gear (designed to reduce incidental capture of sea turtles). The SEFC also continued studies to evaluate the effects of brine disposal on shrimp stocks off Texas and Louisiana and cosponsored a workshop on the "Scientific Basis for the Management of Penaeid Shrimp Stocks." The South Carolina WMRD collected catch data and monitored migration patterns, distribution, and trends in abundance and evaluated the potential of postlarval sampling as an indicator of recruitment. The Georgia DNR conducted sampling to delineate estuarine nursery areas, to monitor trends in seasonal abundance and geographic distribution (including postlarval shrimp) and to provide baseline data for management. The Georgia DNR also continued mark-recapture studies and development of predictive harvesting models.

Rock Shrimp (Sicyonia brevirostris)

The South Carolina WMRD conducted life history studies and collected fishery catch data.

Spiny Lobster (Panulirus argus)

The Georgia DNR completed baseline studies to identify and assess spiny lobster resources. The Florida DNR studied biology, movements, and effects of different harvesting practices. The SEFC prepared stock assessments, initiated harvest monitoring studies for Puerto Rico and the U.S. Virgin Islands, and prepared an economic data base for the southeastern United States.

American Lobster (Homarus americanus)

The Maine DMR continued surveys of the commercial fishery, stock assessment, distribution studies and evaluation of biological parameters. Studies on nutritional requirements continued at WHOI. Simulation modeling with age/growth data was initiated at the University of Massachusetts. Connecticut Department of Environmental Protection (DEP) and Rhode Island personnel continued collection of fishery statistics, and the New York DEC initiated studies on movements, growth, and mortality rates. NEFC personnel conducted assessment work for offshore populations. The Lobster Plan Development Team⁴ continued collection of data and analyses for inclusion in a new Fishery Management Plan. The NEFC also coordinated compilation of a series of papers on larval distribution for future publication.

Blue Crab (Callinectes sapidus)

The Delaware DNR initiated monitoring of recruitment to evaluate population trends; the New Jersey Department of Environmental Protection (DEP) and the South Carolina WMRD conducted sampling to monitor trends in abundance and to evaluate movements. The Georgia DNR continued sampling to delineate estuarine nursery areas, to monitor trends in abundance and to assess seasonal and geographic distribution patterns. The University of Maryland continued work on larval transport. The Florida DNR completed a synopsis on biology and continued biological and assessment studies.

⁴The Lobster Plan Development Team consists of state and federal scientists working jointly under the coordination of the New England Regional Fishery Management Council.

Jonah Crab (Cancer borealis)

The Maine DMR conducted a variety of biological and management-related research projects; the Rhode Island DEM conducted assessment studies to evaluate growth, mortality, population size/sex composition and commercial catch rates.

Red Crab (Geryon quinquedens)

NEFC personnel continued biology and distribution studies and completed examination of commercial catch-effort trends.

Stone Crab (Menippe mercenaria)

The Florida DNR conducted investigations to assess implications of claw reversal and regeneration relative to fishery management. The SEFC prepared a stock assessment and completed an economic data base for the fishery.

U.S.S.R.

(A.A. Elizarov)

Crustacea

In the Norwegian and Barents Seas regularities of shrimp vertical distribution were revealed. 3 000 deep water shrimp specimens were taken for biological analysis, 3 650 shrimp larvae were identified and measured.

